GHANA FURTHER ANALYSIS

The Stall in Mortality Decline in Ghana

Further Analysis of Demographic and Health Surveys Data

The Stall in Mortality Decline in Ghana

Further Analysis of Demographic And Health Surveys Data

Kiersten Johnson
Shea Rutstein
Pav Govindasamy

ORC Macro
Calverton, Maryland, USA

December 2005

USAID
FROM THE AMERICAN PEOPLE

This report presents findings from a further analysis study undertaken as part of the followup to the 2003 Ghana Demographic and Health Survey (GDHS). ORC Macro provided technical assistance for the project. Funding was provided by the U.S. Agency for International Development (USAID) under the terms of Contract No. HRN-C-00-97-00019-00. The opinions expressed herein are those of the authors and do not necessarily reflect the views of the USAID.

This report is part of the MEASURE DHS program, which is designed to collect, analyze, and disseminate data on fertility, family planning, maternal and child health, nutrition, and HIV/AIDS.

Additional information about the GDHS can be obtained from the Ghana Statistical Service, P.O. Box 1098, Accra, Ghana (Telephone: (233-21) 671-732 and Fax: (233-21) 671-731). Information about the DHS program can be obtained from MEASURE DHS, ORC Macro, 11785 Beltsville Drive, Suite 300, Calverton, MD, USA (Telephone: 301-572-0200; Fax: 301-572-0999; E-mail: reports@orcmacro.com; Internet: http://www.measuredhs.com).

Suggested citation:

Johnson, Kiersten, Shea Rutstein, and Pav Govindasamy. 2005. *The Stall in Mortality Decline in Ghana: Further Analysis of Demographic and Health Surveys Data.* Calverton, Maryland, USA: ORC Macro.

Contents

Executive Summary

The second half of the twentieth century bore witness to significant declines in mortality among children in the developing world. Ghana was no exception, experiencing declines in mortality from the 1950s onward. A series of Demographic and Health Surveys conducted in Ghana documented substantial improvements in infant and childhood mortality rates between 1988 and 1998. The results of the 2003 survey, however, indicated that these rates had plateaued (stagnated) at high levels. There was some concern that mortality might even be on the rise.

The purpose of this analysis is to determine whether the stagnation in the decline in childhood mortality in Ghana is real, to describe and evaluate trends in mortality, and to examine the key factors likely to influence mortality levels. This analysis suggests that the apparent uptick in mortality seen in the 2003 GDHS is largely a function of the underestimation of mortality in the previous survey.

Thus, while there is no evidence to conclude that child mortality in Ghana is increasing, the past three Ghana DHS surveys provide substantial evidence that the decline in mortality in Ghana has stagnated at high levels. The trend data reviewed here suggest that there may be a continuing problem with children receiving adequate nourishment. There is also room for improvement in maternal and child health care indicators. Policies and programs designed to improve these indicators may help to facilitate the resumption of the downward trend in childhood mortality rates in Ghana.

1 INTRODUCTION

1.1 Overview and Purpose

The second half of the twentieth century bore witness to significant declines in mortality among children in the developing world. During the 1960s and 1970s, researchers speculated that the pace of decline in mortality in developing countries would result in a significant narrowing of the mortality gap between the developed and developing countries by the end of the 20th century, regardless of prevailing economic conditions (Stolnitz, 1965).

Ghana was not excluded from the experience of steady and significant declines in mortality from 1955 to about 1998, with under-five mortality rates decreasing steadily at an average of 8 percent per quinquennial (Ahmad et al., 2000). Demographic and Health Surveys[1] conducted in Ghana have also documented substantial improvements in infant and childhood mortality rates between 1988 and 1998; however, the results of the 2003 Ghana DHS indicate that rates of infant and child mortality have plateaued since 1998. It is particularly worrisome that in Ghana the pace of decline has come to a halt at very high levels of mortality. The purpose of this analysis, therefore, is first to determine whether the stagnation in mortality decline in Ghana is real, and second to describe and evaluate trends in mortality in Ghana, as well as trends in key factors likely to influence mortality, with the aim of discerning what changes may have occurred over time to cause mortality rates to plateau.

Section 1.2 sets the macro-level context for the analysis of micro-level data. Although no statistical correlations can be drawn between national-level phenomena and individual level events such as the death of a child, it is important in thinking about why mortality declines have leveled off to consider the ways in which macro-level events might impact household-level occurrences. Section 1.3 describes the 1988, 1993, 1998 and 2003 Ghana DHS datasets, and Section 1.4 describes the mortality trends in Ghana from 1955 to the present.

The purpose of Section 2 is to assess the quality of the Ghana DHS mortality data, to determine if data quality, rather than change in mortality levels, may explain why the mortality decline in Ghana has plateaued.

In Section 3, key mortality-related variables from the four Ghana DHS surveys are analyzed to determine what may have changed from the time when decline in mortality was evident to the times when no decline in mortality is observed. Bivariate analyses compare data from the 1988, 1993, 1998 and 2003 Ghana DHS.

1.2 Context

The purpose of this section is to provide a relevant national-level context for discussing mortality declines over the past several decades, and the recent stall in mortality decline. This section reviews recent macro-level political, economic, and health situations in Ghana.

[1] Demographic and Health Surveys provide national and subnational data on family planning, maternal and child health, child survival, HIV/AIDS/sexually transmitted infections (STIs), infectious diseases, reproductive health and nutrition.

1.2.1 Political Background

In 1957, Ghana (current population 20.4 million) became the first state in sub-Saharan Africa to achieve independence from colonial rule under the leadership of Kwame Nkrumah, who established Ghana as a republic in 1960.[2] Ghana subsequently experienced the rise and fall of several "republics." Nkrumah's rule, combined with a collapse in the nation's economy, prompted a coup when the president was away in China in 1966, ending Ghana's first republic. A general election in 1969 ushered in the second republic with Kofi Busia as prime minister; he was a university professor and long-time political opponent of Nkrumah. Busia's tenure, possibly shortened by economic crises of devaluation and subsequent inflation, was ended without bloodshed by military officers in 1972.

Military regimes then maintained political power in the country under the successive leadership of two generals, Ignatius Acheampong and Frederick Akuffo. In 1979, with political promises unfulfilled and the economy in crisis, a group of younger officers led by Flight Lieutenant Jerry Rawlings took power. Acheampong, Akuffo, and six other senior military officers were executed. A constitution was adopted, and arrangements were made to conduct elections, with power being handed over to Hilla Liman in 1979. This third republic lasted only two years before Rawlings and his fellow officers intervened again, with Rawlings taking power in 1981. After surviving four coup attempts over the course of two terms, Rawlings stood down for the presidential election of December 2000, which was won by the opposition leader, John Kufuor. Kufuor's government set up a National Reconciliation Commission, considered by many to be the most important human rights event in the history of the nation, meant to address the abuses that Ghanaians suffered under Rawling's brutal regimes (Sarpong, 2004).

1.2.2 Economic Background

Prior to the 1970s' economic crisis, Ghana had achieved the highest GDP on the African continent (World Bank, 2005). However, the currency devaluation that took place in the 1971, followed by subsequent failures to devalue the currency as needed, led to inflationary crises throughout the decade; the GNP declined at a rate of 1 percent per year between 1975 and 1983 (Alderman, 1994). In 1981, Ghana suffered an economic shock when the price of the primary export crop of the rural economy, cocoa, dropped to a third of its 1977 peak; a second shock occurred in 1983 when Nigeria expelled up to 1 million expatriate workers and their families back to Ghana (Alderman, 1994).

In 1983, Ghana with the assistance of the International Monetary Fund (IMF) implemented the first phase of their structural adjustment program, Economic Recovery Programme I (ERP I), which ran through 1986. Its purpose was to stabilize the Ghanaian economy. It began with a massive currency devaluation, followed by eight other devaluations in the following three years (Alderman, 1994). ERP I was followed by ERP II (1987-89), which was intended to consolidate gains made under ERP I. As it was well recognized that the worst of the effects of structural adjustment fall upon the poorest segments of society, PAMSCAD (Programme of Actions to Mitigate the Social Costs of Adjustment) was implemented at the end of 1987, in an effort to give the second phase of the structural adjustment a more "human face" (Gayi, 1995). For a variety of reasons, including improved weather, the GNP rebounded to an annual average growth of 5.4 percent between 1983 and 1988.

In late 1999, Ghana suffered another trade shock: prices for Ghana's two main exports, gold and cocoa, fell while prices for petroleum imports rose. Again, the combination of the shock with a delay in adjusting fiscal and monetary policy led to a sharp deterioration in macroeconomic performance,

[2] Information on the political history of Ghana is drawn largely from a background document on Ghana from the US Department of State, Office of Public Communication, Bureau of Public Affairs, 1990.

depreciation of the exchange rate, and increased inflation (World Bank, 2005). In early 2000, the government responded by tightening monetary policy, postponing public expenditures, and raising the VAT rate. Despite these adverse economic events, the GDP has grown at an annual average of 4.9 percent over the past two decades.

1.2.3 Health System Configuration and HIV/AIDS

Health System Decentralization

In 1996, Ghana initiated a decentralization of its health care system. What effect, if any, this process has had on preventive and curative care at the local level is not known. The government of Ghana has delegated some authorities to the autonomous Ghana Health Service, and to the semiautonomous Budget Management Centers. The process of decentralization can imply varying degrees of latitude over a variety of types of decisionmaking at the local level. In a comparative analysis of four developing countries that have recently initiated decentralization of their health care systems, Bossert and Beauvais (2002) find that decisionmaking in Ghana is still highly hierarchical and centralized, with a very narrow range of decisionmaking authority actually delegated to local-level players.

It is of interest to note that the percentage of public sector health resources allocated to district health services "increased from 22.8 percent in 1996 to 34 percent in 1997, and that of the regional health services from 17 to 25 percent" (Bossert and Beauvais, 2002). This increase in funding at the local and regional level was achieved by decreasing the resources allocated to tertiary care from 31 percent to 22 percent. User fees constituted approximately 19 percent of Ministry of Health expenditures in 1997 (Bossert and Beauvais, 2002).

HIV/AIDS in Ghana

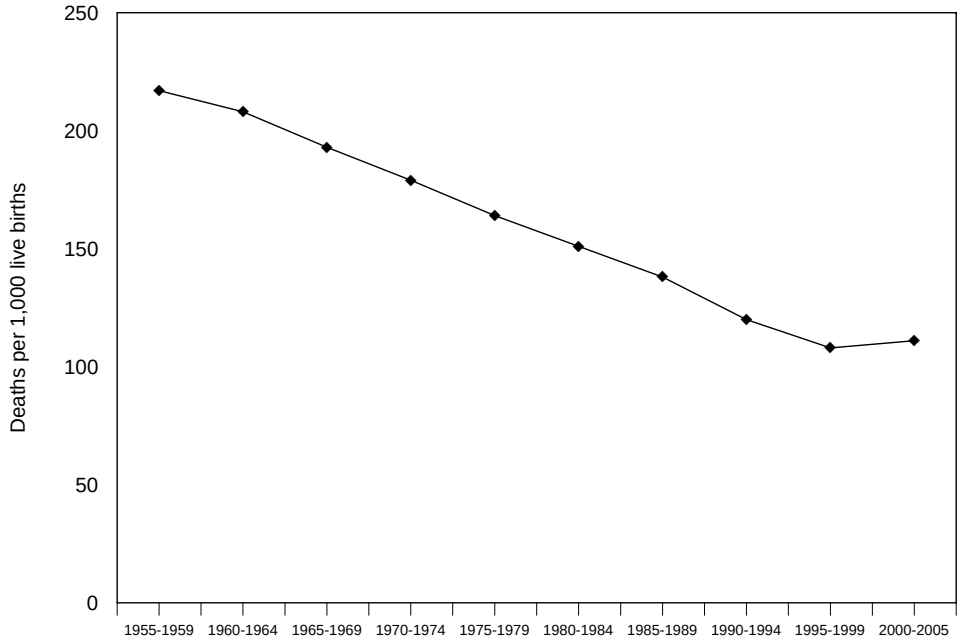
The prevalence of HIV in a country may be associated with increases in infant and under-five mortality, as noted in some high prevalence countries such as Kenya and Zimbabwe. However, even some countries that have very high HIV prevalence do not register increases in infant and under-five mortality (Zambia, for example). The 2003 Ghana DHS established Ghana's HIV prevalence at 2 percent. This level is much lower than that in the highly affected countries of East Africa, and at this point, the HIV epidemic is unlikely to be responsible for the failure of infant and child mortality rates to continue to decline.

1.3 Long-term Trends: Steady Declines

Figure 1.1 shows the decline in Ghana's quinquennial under-five mortality rates for the period 1955 to 2003; most data here are drawn from Ahmad et al. (2000), with the data for the past 20 years derived from the Ghana DHS.[3] The data show a clear and steady decline for most of the second half of the last century, with a flattening in the trend only between 1995-1999 and 2000-2005.

[3] Ahmad et al.'s under-five mortality estimate for the period 1995-1999 was too high compared with data from the 1998 Ghana DHS, and so was adjusted from 116 to 108 (the under-five mortality rate from the 1998 GDHS). The estimate shown for 2000-2005 is the under-five mortality rate from the 2003 Ghana DHS.

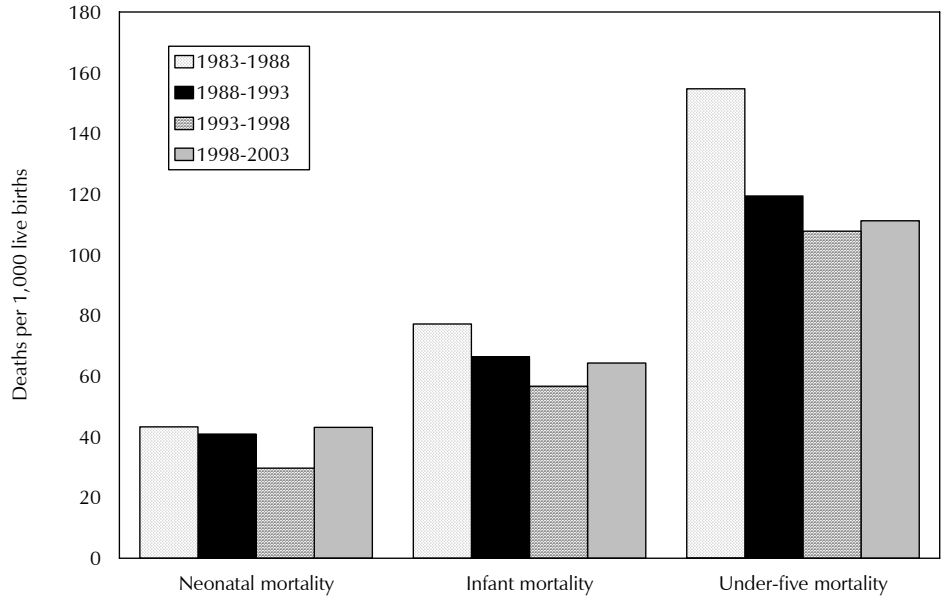
Figure 1.1 Under-five mortality rate, Ghana 1955-2005



1.4 Short-term Trends: Stagnation

Figure 1.2 shows the decline and stagnation (or increase) in several child mortality indicators for Ghana using the 1988, 1993, 1998 and 2003 Ghana DHS surveys.

Figure 1.2 Neonatal, infant, and under-five mortality, five-year rates Ghana 1988, 1993, 1998, and 2003 Demographic and Health Surveys



Despite Ghana's experience of significant political and economic difficulties over the past 50 years, available data indicate that under-five mortality rates declined at an average of 8 percent per five-year period between 1955 and 1995 (Ahmed et al., 2000). However, during a period of relative political and economic stability (1995 to the present), Demographic and Health Surveys data indicate the absence of continued improvements in the area of child survival.

2 Is the Stagnation in Mortality Decline in Ghana Real? An Assessment of Data Quality

2.1 Survey Sample Sizes and Mortality Rates

Ghana conducted DHS surveys in 1988, 1993, 1998, and 2003. Data collected under the DHS Survey program is highly comparable both across countries and over time, because of standardization in sampling and data collection methodologies and protocols. In Ghana, the same organization has collected all four rounds of DHS data, thus enhancing the comparability of these datasets. Information on dates of fieldwork and sample sizes is included in Table 2.1.

Table 2.1 Description of the Ghana Demographic and Health Surveys (GDHS) included in the analysis

Year	Dates of fieldwork	Implementing organization	Number of households interviewed	Number of women 15-49 interviewed
1988	02/01/1988 - 05/01/1988	Ghana Statistical Service	4,406	4,488
1993	09/01/1993 - 01/01/1994	Ghana Statistical Service	5,822	4,562
1998	11/01/1998 - 02/01/1999	Ghana Statistical Service	6,003	4,843
2003	07/25/2003 - 10/25/2003	Ghana Statistical Service	6,251	5,691

Table 2.2 shows the trends in various mortality rates for Ghana over the four survey periods. Neonatal mortality, which occurs within the first thirty days of life, seemed to decline over time, from 43 neonatal deaths per thousand live births in 1988 to 41 in 1993 and 30 in 1998. However, in 2003, neonatal mortality rates seem to have regressed to those of 1988, with 43 neonatal deaths per 1,000 live births.

Table 2.2 Trends in early childhood mortality rates

Neonatal, postneonatal, infant, child, and under-five mortality rates, Ghana 1988-2003 (five-year rates)

Survey year	Approximate calendar period	Neonatal mortality ($_1q_0$)	Postneonatal mortality (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
1988	1983-1987	43	34	77	84	155
1993	1989-1993	41	26	66	57	119
1998	1994-1998	30	27	57	54	108
2003	1999-2003	43	21	64	50	111

Postneonatal mortality, those deaths occurring after the first month of life but before the first year of life has been completed, seems to have maintained a downward trajectory, in contrast to the neonatal mortality rates. Infant mortality consists of all deaths that occur before the first year of life has been completed. Infant mortality rates can be obtained by summing the neonatal and postneonatal mortality rates. The rise in neonatal mortality in 2003 is more pronounced than the decline in postneonatal mortality; as a result, infant mortality declines from 1988 through 1998, but increases again in 2003.

Child mortality consists of those deaths that occur to children between the ages of 1 and 4 years. The data indicate that child mortality has been declining steadily since 1988. Under-five mortality is the sum of all deaths that occur to children who were born alive but did not survive until their fifth birthday. Because of the large increase in neonatal mortality, the decline in under-five mortality continues only from 1988 to 1998; there is a slight increase in under-five mortality in 2003, with 111 deaths of children under five years of age for every 1,000 children born.

These data show that mortality among children under five years had been declining fairly steadily over the past 20 years, but that a recent uptick in mortality, predominantly neonatal mortality, has caused the two key mortality indicators, infant and under-five, to stop declining, or possibly increase slightly.

To ascertain that the mortality data from the 2003 survey are not anomalous, and are showing a real break from previously established trends, it is necessary to assess the quality of the data; this is addressed in section 2.2.

2.2 Assessment of Data Quality[4]

The validity of the apparent stagnation/increase in mortality rates in Ghana needs to be assessed. First, the quality of the data may have changed between surveys; second, changes in mortality estimates over time could result from sampling variability, and not reflect true changes in trends.

Four types of reporting errors can affect period mortality rates such as those produced with data from DHS surveys: there can be omissions of births and/or deaths, incomplete information on the date of birth or death, displacement of events in time, and misreporting of age at death. It is sometimes possible, however, to detect these errors if they are systematic.

[4] This section of the analysis is guided by the work of Stan Becker (2005).

2.2.1 Omissions of Births/Deaths

There are three indirect approaches that can be used to assess whether omissions of deaths have occurred: looking at 1) the ratio of early neonatal mortality to all neonatal mortality, 2) the ratio of neonatal to all infant mortality, and 3) the sex ratio at birth.

Approximately 70 percent of neonatal deaths are expected to occur during the first 6 days of life—the early neonatal period (Sullivan et al., 1990); the ratio tends to rise, however, as overall mortality levels fall. If the ratio of deaths in the early neonatal period to all deaths in the neonatal period is less than 70 percent, it may indicate the omission of neonatal deaths.

Table 2.3 Ratio of early neonatal (ENN) deaths to neonatal (NN) deaths for all Ghana surveys (weighted)

Survey year	ENN deaths	NN deaths	Ratio ENN:NN
1988	142	180	78.9
1993	112	153	73.2
1998	78	84	92.9
2003	130	155	83.9

Table 2.3 shows the numbers of early neonatal and neonatal deaths for each survey period, as well as the ratio of early neonatal to neonatal deaths. The ratios for 1988 and 1993 are the closest to the expected 70 percent, while those for 1998 and 2003 are much larger. This indicates that there is not a problem with underreporting of early neonatal deaths; there may, however, be misreporting of neonatal deaths in the 1998 survey—almost all neonatal deaths reported in the 1998 survey were reported as early neonatal deaths, which is substantially more than expected. One would expect to see an increase in the proportion of early neonatal deaths to all neonatal death under conditions of overall mortality decline. This may still be the case in Ghana, since, although the infant and under-five mortality rates appear to have stagnated or increased, in fact the greatest increase in mortality is in the neonatal period; mortality continues to decline in the postneonatal period and among children between the ages of 1 and 4 years.

Similarly, the ratio of neonatal mortality to all infant mortality is expected to increase with declining overall mortality. Table 2.4 shows the neonatal and infant five-year mortality rates for each survey period, and the ratio of neonatal to infant mortality. The pattern shown in Table 2.4 is inconsistent over time, with the ratio for the 1998 survey deviating from the overall trend. This could indicate underreporting of neonatal deaths during the 1998 data collection exercise.

Table 2.4 Ratio of neonatal (NN) deaths to infant (INF) deaths for all Ghana surveys (weighted)

Survey year	NN deaths	INF deaths	Ratio NN:INF
1988	180	299	60.2
1993	153	237	64.6
1998	93	175	53.1
2003	155	225	68.9

We can also look at the sex ratio at birth to discern whether births or deaths were omitted on the basis of sex; normally we would expect to find this kind of omission in societies that devalue one sex or the other. The normal human sex ratio at birth ranges from 103-107 males for every 100 females (James, 1987). Ratios significantly above or below this range are suggestive of omissions. Table 2.5 indicates that sex ratios at birth in Ghana are approximately normal for all surveys except for 1998, where it appears that births of male children have been underreported.

Table 2.5 Ratio of male (M) births to female (F) births for all Ghana surveys (weighted)

Survey year	M births	F births	Ratio M:F
1988	2,103	2,033	103.4
1993	1,132	1,072	105.6
1998	1,573	1,621	97.0
2003	1,841	1,798	102.4

2.2.2 Incomplete Information

Even if a respondent reports all of her births and all of the deaths that may have occurred among her children, she may not be able to provide complete information on the timing of the events of birth or death. In such cases, it is necessary to impute the missing information. Missing information on date of birth, however, does not constitute a problem for the Ghana DHS data. Table 2.6 indicates that both year and month of birth was reported for 88 percent of children in 1988, for 94 percent of children in 1993 and 1998, and for all children in 2003. Of the 13,173 births reported in all four surveys combined, only 8 cases required imputation of both year and month of birth. Month of birth alone is the piece of information most likely to be missing, but "if the year is correct then imputing a month makes virtually no difference in mortality estimates for multi-year periods" (Becker, 2005).

Table 2.6 Completeness of reporting on date of birth for all Ghana surveys (weighted)

Data reporting	1988	1993	1998	2003
Month & year reported	88.6 (3,664)	94.2 (2,076)	93.8 (2,995)	100.0 (3,638)
Year & age reported, month imputed	2.5 (103)	0.2 (5)	4.3 (138)	0.0 (1)
Year & age reported, year ignored	5.8 (240)	3.7 (82)	- -	- -
Year reported, age & month imputed	3.0 (124)	1.7 (37)	1.9 (61)	- -
Age reported, year calculated, month imputed	0.0 (1)	- -	- -	- -
No data reported, all imputed	0.1 (4)	0.2 (4)	- -	- -
Number of births	4,136	2,204	3,194	3,639

2.2.3 Displacement of Events in Time

Because interviewers have to complete the long and complex maternal and child health sections of the DHS questionnaire for each child born within three or five years of the survey (depending on the survey year), there is an incentive for interviewers to reduce their workload by recording the child's date of birth as outside the range of eligibility for those sections (i.e., born more than three or more than five years before the survey).

This would affect mortality rates if it happened in a frequent and systematic fashion. Displacement of births beyond the reference date of the maternal and child health sections is discerned by tabulating the number of births for each year of birth for all children regardless of survival status, and then calculating the following ratio, where Bx is the number of births reported in year x. These ratios should be close to 100.

$$100 * (2B_x/(B_{x-1} + B_{x+1}))$$

A value of less than one hundred implies fewer births than expected for year x.

In Table 2.7, the displacement ratio is calculated where 1) x is the last year for which a child is eligible and 2) x is the year prior to the last year of eligibility for the maternal and child health sections. The last year of eligibility for these sections is the fifth year preceding the survey, except for the 1993 survey, where only children born within three years preceding the survey were eligible.

Table 2.7 Displacement of events: displacement ratios of all births, and births of children who died
(Displacement ratio: 100 * (2Bx/Bx-1 + Bx+1))

	x=last year of eligibility		x=year prior to last year of eligibility	
Survey year	All births	Births of children who died	All births	Births of children who died
1988	100.8	107.3	105.7	100.8
1993	72.2	81.9	149.6	139.4
1998	88.6	81.3	115.6	148.2
2003	78.1	47.9	119.4	152.6

Table 2.7 indicates that there is a problem with birth displacement in all but the 1988 survey: all of the values for all births for the year before the eligibility cutoff are 116 or higher, and all of the values for all births for the year after the cutoff are 89 or lower. This clearly demonstrates that the interviewer is displacing births over the line of eligibility. Most egregious in the 2003 survey is the displacement of births of children who have died: the number of births recorded in the last year of eligibility is less than half of that expected, whereas the ratio of births of children who died is 50 percent higher than expected in the year prior to the eligibility cutoff.

When the displacement of children who have died is greater than that of living children (as occurs with all of the Ghana data with the exception of the 1988 survey), it tends to cause a negative bias in estimates of childhood mortality for the recent period (0-4 year estimates). Models indicate that this bias

can underestimate infant mortality rates for the recent period from between 2.5 to 4 percent, and overestimate infant mortality rates for the preceding period (5-9 year estimates) by the same amount (Sullivan, Bicego and Rutstein, 1990).

2.2.4 Misreported Age at Death

If a mother has experienced the death of one of her children born in the five years preceding the survey, the DHS interviewer asks the woman to specify the age of the child when he or she died. If the child was less than one month old, she is asked to give the child's age in days; if the child was older than one month but less than two years of age, she is asked to give the child's age in months; and if the child was older than two years of age, she is asked for the child's age in years. Respondents may round the number of days or months that their child lived to an approximate rather than exact number, with the tendency to heap reported ages at death on 7 days, 30 days, 12 months, and 24 months. Heaping is particularly problematic when it occurs at the reported age of 12 months, since deaths at 12 months of age will not be categorized as infant deaths but rather as child mortalities. The implication of heaping at 12 months is that there will be some amount of underestimation of infant mortality, a key national-level indicator of child health and welfare, since some of the deaths reported at 12 months will actually be deaths that occurred among children who were 10 or 11 months of age when they died.

The magnitude of this problem can be discerned by calculating a heaping ratio, which should be close to one if there is no heaping. Dx is the number of deaths reported at age x. The heaping ratio used here is:

$$3 * D12/(D11 + D12 + D13)$$

Table 2.8 shows the heaping ratios for heaping on reported age at death on month 12. It indicates that there is evidence of heaping—there are 2-3 times more reported deaths at the age of 12 months than expected. This implies that the infant mortality rate is somewhat underestimated. What is not known, however, is the degree of underestimation involved, since it is not possible to know what proportion of deaths occurred at an earlier age.

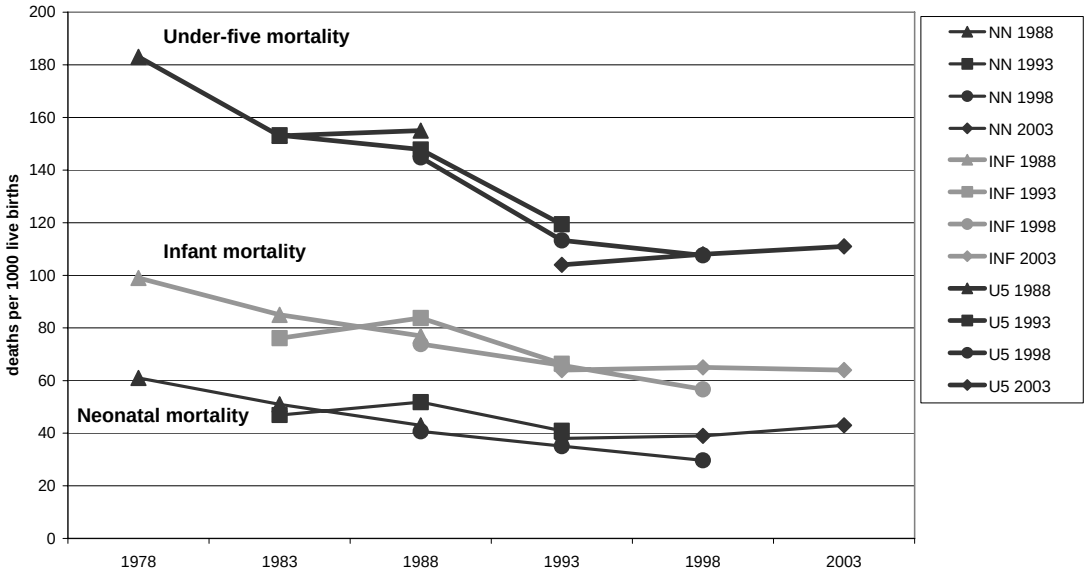
Table 2.8 Heaping of reported age at death on month 12: heaping ratios (Heaping ratio: 3*D12)/(D11+D12+D13))

Survey year	Heaping ratio
1988	2.9
1993	1.6
1998	1.9
2003	2.6

Finally, to assess the consistency of the data from survey to survey, we can look at trends in mortality estimates for 0-4, 5-9, and 10-14 years before each survey to see how well estimates for the same time period correspond from one survey to the next. We can also compare mortality rates with 95 percent confidence intervals for the same time period from two different surveys to assess the consistency of the data across data collection efforts.

Figure 2.1 shows the neonatal, infant, and under-five mortality rates for each of three five-year periods before each of the four surveys. It is reassuring to note that there is frequent convergence of estimates of each type of mortality for most period estimates. For example, the 0-4 year under-five mortality estimate from the 1998 GDHS matches exactly that of the 5-9 year under-five mortality estimate from the 2003 GDHS. Similarly, the 10-14 year estimate of infant mortality from the 2003 GDHS, the 5-9 year estimate from the 1998 GDHS, and the 0-4 year estimate from the 1993 GDHS all converge on the same point.

Figure 2.1 Neonatal, infant, and under-five mortality trends in mortality estimates for 0-4, 5-9 and 10-14 years before the survey, Ghana 1988, 1993, 1998 and 2003



However, in some instances, there are also small differences in estimates; for example, the 5-9 year estimates of neonatal and infant mortality from the 2003 survey are both higher than the 0-4 year estimates of neonatal and infant mortality from the 1998 survey. These small differences in estimates between the surveys are not significant, however, as can be seen in Figures 2.2-2.4, which show neonatal, infant and under-five mortality rates with confidence intervals for the same periods of time, but from different surveys. While all of the confidence intervals overlap, it is under-five mortality that maintains the greatest consistency across time and surveys, with neonatal mortality rates showing the greatest variation from survey to survey.

Figure 2.2 Neonatal mortality rates with 95% confidence intervals, Ghana DHS surveys

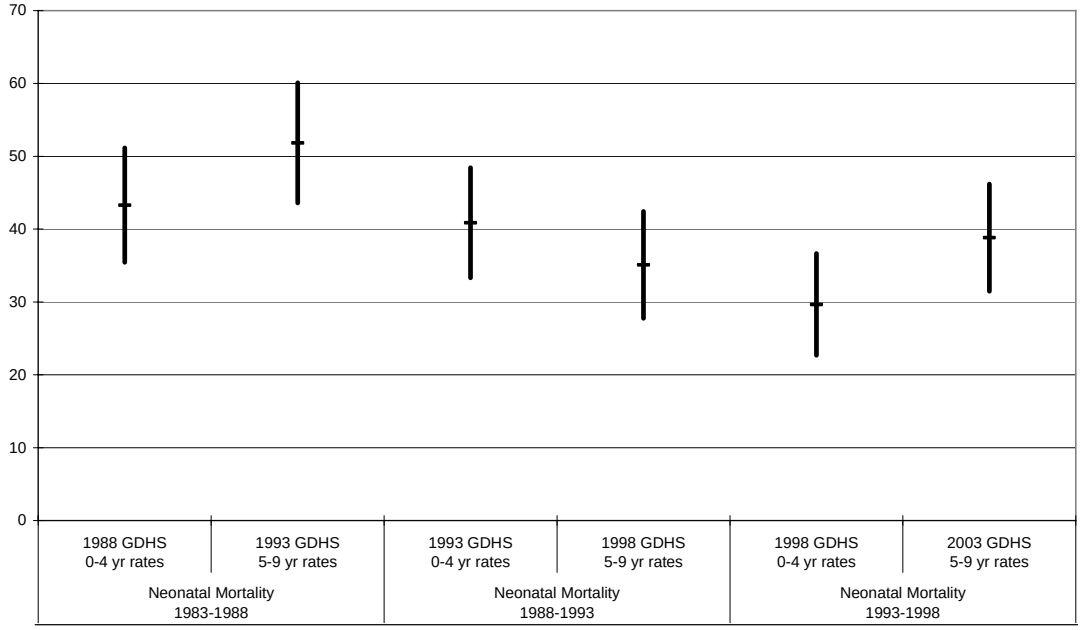


Figure 2.3 Infant mortality rates with 95% confidence intervals, Ghana DHS surveys

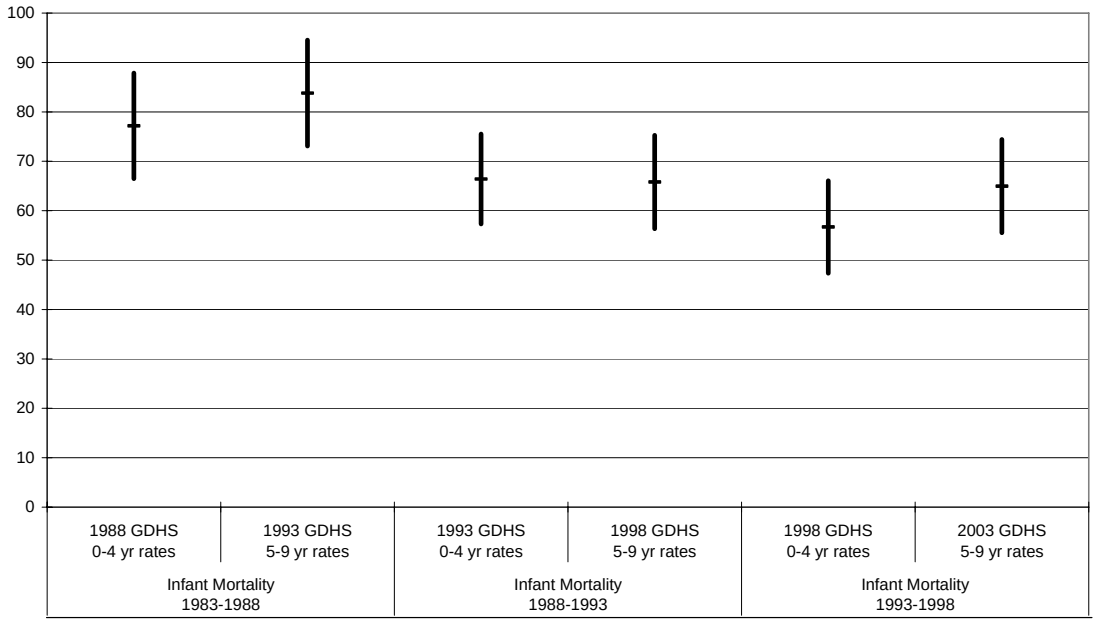
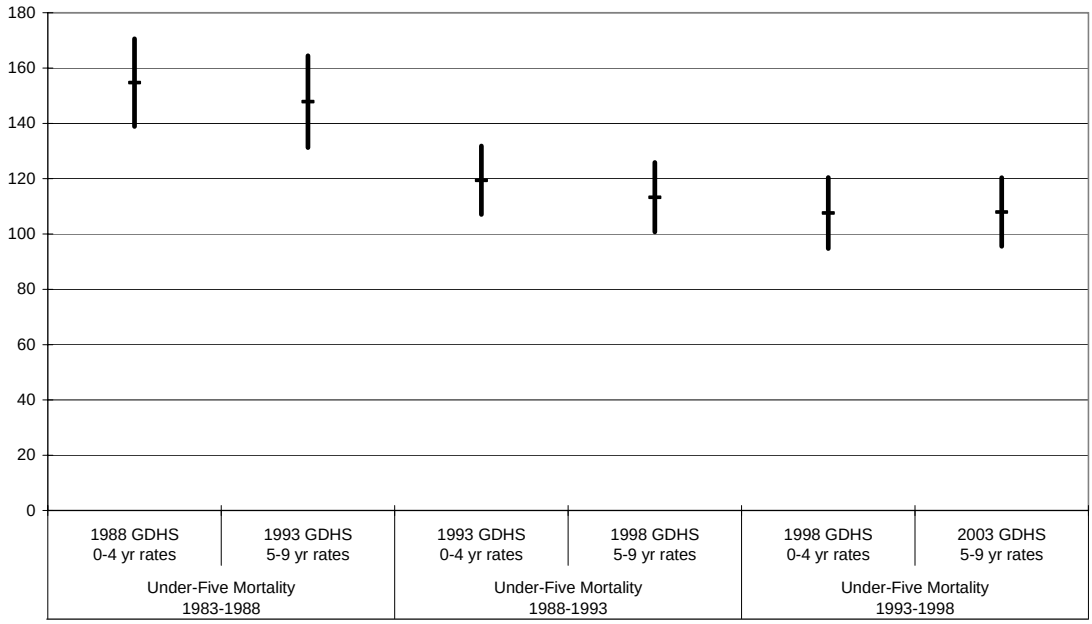


Figure 2.4 Under-five mortality rates with 95% confidence intervals, Ghana DHS surveys



In sum, we find that although the levels of reported mortality are fairly consistent over time and across surveys, there are some data quality issues with the Ghana DHS mortality data. While there is not much of a problem in terms of incomplete information, and there is clear evidence of heaping for reported age at death, particularly age 12 months, the more serious data quality problems revolve around displacement of births and omission of births, particularly regarding the 1998 data.

Table 2.3 showed a ratio of early neonatal to neonatal deaths in 1998 that was much higher than expected; this ratio lay outside the trend set by the other three surveys. Table 2.4 demonstrated a ratio of neonatal to all infant deaths much lower than expected, strongly suggesting that neonatal deaths were underreported in 1998. Table 2.3 also indicates problems with the 1998 data quality in that the ratio of male to female births is not only lower than expected, but also comparatively lower than the approximately uniform ratios from the other three surveys.

Table 2.7 shows that there is a consistent problem with displacement of births, resulting in an underestimate of mortality in the recent period (0-4 year estimates) and an overestimate of mortality in the earlier period (5-9 year estimates). For the 2003 survey, the displacement of children who have died is conspicuously apparent.

These data quality problems, especially for 1998, have particular implications for this analysis of mortality trends in Ghana. It appears that mortality in 1998, particularly neonatal and infant mortality, was underestimated. Heaping on age at death of 12 months was worse in 2003 than in 1998, which may have resulted in a slight underestimation of infant mortality in 2003, and displacement of births was considerably worse in 2003 than in 1998, but this would not have affected neonatal and infant mortality rates, which were the prime drivers of the apparent increase in mortality in the 2003 Ghana survey.

If mortality levels were more correctly estimated in 2003, it would give the false impression of an increase in mortality over time. Given that this analysis revolves around the question of whether the stagnation or possible increase in mortality is real, the problems with the 1998 data suggest that Ghana is not experiencing an increase in mortality but rather a stagnation in the decline of mortality since approximately the 1990s.

3 A Closer Look at Child Mortality

Looking more closely at the Ghana mortality data may give more support to the idea that the 1998 data quality is responsible for the appearance of a slight increase in mortality in the 2003 Ghana DHS. By looking at neonatal, infant, and under-five mortality rates by background characteristics, it may be possible to identify which geographical areas were most subject to underreporting. By assessing trends in factors that influence early childhood mortality, it may be possible to judge whether changes in these factors appear sufficient to influence mortality levels.

3.1 Trends in Mortality Rates by Socioeconomic Characteristics

Table 3.1 shows trends in 10-year neonatal mortality rates by socioeconomic characteristics for each of the four Ghana DHS surveys. By looking at, for example, mortality by urban and rural residence, it is clear that the time trends dip at the 1998 survey, and resume at approximately the same level or somewhat lower than the levels documented by the 1993 data. Certain regions show particularly large dips in 1998, for example, Volta Region: neonatal mortality is 44 in 1988, 40 in 1993, then plummets to 27 in 1998, and is again 44 in 2003. Because we noted in Section 1 of this report that there were significant data quality issues with the 1998 neonatal mortality data that would lead one to suspect that it had been underreported, it seems reasonable to interpret these dips in neonatal mortality by background characteristics as artifacts of the 1998 data and not real declines in mortality.

In Table 3.1, both urban and rural residence types exhibit 1998 mortality levels that are out of line with the trend set by the other survey years. Volta, Ashanti, Northern, and Upper West regions also have particularly steep dips at the 1998 datapoint followed by fairly steep rises up to the 2003 datapoint. Such extreme changes in mortality levels over a short period of time are unlikely to be real.

Table 3.1 Trends in neonatal mortality rates

Neonatal mortality rates for the 10-year period preceding the survey, by background characteristics, Ghana 1988-2003

Background characteristic	Neonatal mortality rates			
	1988	1993	1998	2003
Residence				
Urban	43	39	23	38
Rural	48	49	35	43
Region				
Western	39	47	38	37
Central	87	50	41	(37)
Greater Accra	41	44	26	29
Volta	44	40	27	44
Eastern	40	30	34	42
Ashanti	45	44	22	57
Brong-Ahafo	40	37	(54)	36
Northern	44.0	73	27	38
Upper East		46	26	22
Upper West		(41)	28	62
Mother's education				
No education	47	52	34	37
Primary	43	56	41	49
Middle/JSS	49	35	29	43
Secondary+	50	(28)	(11)	(27)
Wealth quintile				
Lowest	53	47	34	37
Second	50	57	31	40
Middle	39	48	49	49
Fourth	48	39	27	38
Highest	42	33	15	42

Note: Rates in parentheses are based on 250-499 exposed persons.

Table 3.2 shows trends in 10-year infant mortality rates by socioeconomic characteristics for each of the four Ghana DHS surveys. In this table, only the 1998 mortality rate by urban, and not rural, residence, seems particularly anomalous. Volta, Ashanti, and Upper West regions maintain their problematic dip at the 1998 datapoint; Eastern Region also demonstrates the 1998 anomaly.

Table 3.2 Trends in infant mortality rates

Infant mortality rates for the 10-year period preceding the survey, by background characteristics, Ghana 1988-2003

Background characteristic	Infant mortality rates			
	1988	1993	1998	2003
Residence				
Urban	67	55	43	55
Rural	87	82	68	70
Region				
Western	77	76	68	66
Central	138	72	84	(50)
Greater Accra	58	58	41	45
Volta	74	78	54	75
Eastern	70	56	50	64
Ashanti	70	65	42	80
Brong-Ahafo	65	49	(77)	58
Northern	103	114	70	69
Upper East		105	82	33
Upper West		(85)	71	105
Mother's education				
No education	88	87	66	66
Primary	85	86	70	76
Middle/JSS	70	55	54	60
Secondary+	79	(28)	(37)	(29)
Wealth quintile				
Lowest	98	77	73	61
Second	84	95	58	64
Middle	75	83	82	73
Fourth	78	64	52	66
Highest	59	46	26	58

Note: Rates in parentheses are based on 250-499 exposed persons.

Table 3.3 shows trends in 10-year under-five mortality rates by socioeconomic characteristics for each of the four Ghana DHS surveys. Again, the 1998 mortality rate by urban residence is outside the trend. Volta, Ashanti, and Upper West regions continue to have the problematic dip at the 1998 datapoint, while Greater Accra also shows an unusual dip in the 1998 mortality rates.

It is also possible to see the 1998 deviation from neonatal, infant, and under-five mortality trends against the education and wealth background variables. However, it is particularly informative to see that problems with the 1998 data are fairly region-specific: because only one or two teams are responsible for covering each region during fieldwork, the localized nature of the underreporting of mortality points to the likelihood that it was a systematic omission of deaths by a few fieldworker teams that caused the data quality issues with the 1998 mortality data.

Table 3.3 Trends in under-five mortality rates

Under-five mortality rates for the 10-year period preceding the survey, by background characteristics, Ghana 1988-2003

Background characteristic	Infant mortality rates			
	1988	1993	1998	2003
Residence				
Urban	131	90	77	93
Rural	163	149	122	118
Region				
Western	151	132	110	109
Central	209	128	142	(90)
Greater Accra	104	100	62	75
Volta	133	116	98	113
Eastern	138	93	89	95
Ashanti	144	98	78	116
Brong-Ahafo	123	95	(129)	91
Northern	222	237	171	154
Upper East		180	155	79
Upper West		(188)	156	208
Mother's education				
No education	175	166	131	125
Primary	148	141	113	120
Middle/JSS	129	89	91	92
Secondary+	100	(41)	(60)	(34)
Wealth quintile				
Lowest	193	156	139	128
Second	159	173	113	105
Middle	141	139	125	111
Fourth	151	104	94	108
Highest	101	75	52	88

Note: Rates in parentheses are based on 250-499 exposed persons.

3.2 Trends in Factors Influencing Early Childhood Mortality

This section looks at trends in health and social indicators. If the apparent dip in mortality in 1998 followed by the uptick in mortality in 2003 were real and not an artifact of the 1998 data, it would be expected that factors known to influence the risk of mortality would show similar fluctuations over time.

Table 3.4 shows for each Ghana DHS the proportion of children under age five who had received all of their basic vaccinations, who had diarrhea or symptoms of acute respiratory infection (ARI) in the past two weeks, who were given oral rehydration therapy or taken to a health care provider if ill with diarrhea or ARI, who were stunted, whose mother had a low body mass index (BMI), who had short preceding birth intervals, and whose mothers received antenatal care and had skilled attendance at delivery.

Table 3.4 Trends in health-related factors that influence early childhood mortality

Percentage of children under age five with specific health-related factors that influence early childhood mortality, Ghana 1988-2003

	Percentage of children				Number of children			
Health-related factor	1988	1993[a]	1998	2003	1988	1993[a]	1998	2003
Vaccinations								
Received all vaccinations	46.7	54.8	62.0	69.4	782	651	644	695
Morbidity								
Had diarrhea in past 2 weeks	26.3	20.3	17.9	15.2	3,646	2,024	2,948	3,340
Had ARI in past 2 weeks	20.0	10.1	13.8	10.0	3,646	2,024	2,948	3,340
Treatment of sick child								
Diarrhea: taken for treatment	43.1	24.1	26.4	25.5	960	410	529	509
ARI: taken for treatment	49.1	39.5	26.2	44.0	729	204	405	335
Nutritional status of child								
Stunting (below -2 SD)	30.0	26.0	25.5	29.9	1,841	1,819	2,570	3,183
Mother's nutritional status								
Low BMI (>18.5)	u	11.3	11.3	9.3	u	1,963	2,257	4,835
Birth spacing								
Birth interval < 24 months	14.5	15.7	13.4	13.6	599	2,957	2,434	2,807
Birth interval > 35 months	45.7	51.3	56.4	55.8	1,512	2,957	2,434	2,807
Maternal health services								
Received antenatal care	82.4	85.7	87.5	91.9	4,089	2,168	3,194	2,645
Skilled attendance at delivery	40.2	43.8	44.3	47.1	4,089	2,168	3,194	2,645

[a] In the 1993 GDHS, health information was collected only for children under age three.
u = Unknown (not available)

In terms of proportions of children who have received all their vaccinations (BCG, measles, DPT-3 and three doses of polio vaccine), the trend is consistent in its increase over time. This has positive implications for child health. The proportion of children who have had diarrhea recently has been declining modestly yet consistently over time; as diarrheal disease is a primary killer of young children in the developing world, this downward trend in prevalence of diarrhea should suggest decreasing rather than increasing mortality in Ghana. Twenty percent of children were reported as having recently had symptoms of ARI in 1988; subsequently, proportions of children ill with ARI were stable, ranging from 10-14 percent.

Among children who were sick with diarrhea, the proportions taken for treatment are stable over time, after an initial decline between 1988 and 1993. Among children who were sick with ARI, proportions taken for treatment demonstrate a steady decline over time, until 2003, when there is a sharp upturn in the percent of children with ARI taken for medical attention. Neither of these indicators suggests a correlation with increased mortality.

Nutritional status, as reflected by the proportion of children moderately to severely stunted,[5] is the only indicator in this table that indicates a possible decline in child health in Ghana: 30 percent of children in 1988 were determined to be stunted; this figure declined slightly for 1993 and 1998, to 26 percent, then returned to 30 percent in 2003.

There has been no effective change in maternal health over time as indicated by maternal nutritional status/BMI, and proportions of births too closely spaced also have changed negligibly. There have been small but steady increases over time in the proportions of births to women receiving antenatal care and skilled delivery assistance.

In sum, the data shown in Table 3.4 do not provide supporting evidence for the apparent upturn in infant or child mortality. Rather, they support the interpretation that mortality was underestimated in 1998 and has in fact changed very little over time.

Table 3.5 looks explicitly at complete vaccination coverage by background characteristics. Vaccination is critical for child survival: the implementation of routine immunization against childhood illnesses has saved over 20 million lives in the last two decades. Only the provision of safe drinking water exceeds the capacity of immunization to reduce disease and mortality rates (UNICEF, 2005).

Complete vaccination coverage is one indicator that might be expected to presage significant changes in mortality levels: if vaccination coverage were to drop, one might expect to see an increase in mortality. This analysis addresses the question of whether there has been an increase in mortality between 1998 and 2003 in Ghana; if changes in vaccination coverage were associated with such an increase in mortality, declines in vaccination coverage should be evident in Table 3.5.

However, for all background characteristics, there is a clear trend towards consistently-improving immunization coverage. Vaccination coverage improves over time in both urban and rural areas, by all women's education levels, and in each wealth quintile. With regard to region, in five out of ten regions, the positive trend toward improved immunization coverage is clear; in three regions, the trend is fairly flat (Greater Accra, Ashanti, and Northern); and in two regions, vaccination coverage is seen to peak in 1998 and drop somewhat in 2003 (Western and Upper West). Overall, there is no dip in vaccination coverage trends that would suggest an increase in mortality in 2003.

[5] Stunting reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness, therefore representing the long-term effect of malnutrition in a population. Stunting does not vary according to recent dietary intake.

Table 3.5 Trends in vaccination coverage

Percentage of children age 12-23 months who received all recommended vaccinations (according to health card or mother's report), by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children fully vaccinated				Number of children			
	1988[a]	1993	1998	2003	1988[a]	1993	1998	2003
Residence								
Urban	60.3	71.1	72.3	75.5	217	197	180	248
Rural	37.6	47.8	58.0	66.0	565	454	463	447
Region								
Western	31.8	49.2	67.4	60.4	75	59	105	59
Central	65.6	39.2	49.1	82.1	96	74	73	68
Greater Accra	60.7	75.0	73.7	69.1	79	64	71	75
Volta	41.3	52.7	59.8	82.3	89	74	65	66
Eastern	22.7	56.3	52.1	65.6	118	64	84	77
Ashanti	44.0	64.3	67.8	71.6	129	115	107	123
Brong-Ahafo	52.9	57.1	(66.6)	79.0	100	70	45	75
Northern	50.0	39.0	47.4	48.0	96	64	38	92
Upper East		40.0	68.0	60.3		25	17	21
Upper West		64.3	65.8	77.0		42	38	39
Mother's education								
No education	34.9	42.2	47.1	57.3	328	256	234	244
Primary	30.6	44.3	63.3	66.8	126	122	134	155
Middle/JSS	55.9	68.4	72.7	79.2	291	228	236	256
Secondary+	79.2	86.7	(82.4)	(90.6)	37	45	39	39
Wealth quintile								
Lowest	36.7	25.8	37.9	53.7	169	114	330	177
Second	32.5	30.7	41.8	72.4	240	151	288	153
Middle	34.9	33.9	45.7	74.2	232	156	292	122
Fourth	39.6	40.3	51.2	73.9	273	178	293	121
Highest	47.0	50.5	64.8	79.1	302	186	276	123

Note: Figures in parentheses are based on 25-49 unweighted cases.
[a] For 1988, only children who had a health card were included.

Diarrhea is well known to be a major cause of death of children under the age of five. As in the preceding discussion of vaccination, diarrhea is another indicator likely to be associated with significant changes in mortality levels: if prevalence of diarrheal disease were to increase over time, one might expect to see an increase in mortality. Table 3.6 indicates, however, that diarrheal disease has been steadily declining over time, and no increase in diarrheal disease is exhibited between the 1998 and 2003 Ghana DHS Surveys.

Steady decreases in proportions of children under five who have had diarrhea in the past five years are observed for both urban and rural residents. Seven of ten regions exhibit a decline in the prevalence of diarrhea; two show an increase (Eastern and Upper West regions), and one shows no significant change in diarrheal prevalence between 1998 and 2003 (Upper East). Diarrhea has decreased among children of mothers with no education or only primary education, while it has changed little over the past three surveys for those whose mothers have more than primary education.

Table 3.6 Trends in prevalence of diarrhea

Percentage of children under five years of age with diarrhea in the two weeks preceding the survey, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children with diarrhea				Number of children			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	27.0	17.6	16.7	13.6	1,006	568	733	1,114
Rural	26.1	21.3	18.3	16.1	2,640	1,456	2,215	2,225
Region								
Western	18.8	20.5	18.0	14.4	325	185	381	332
Central	31.1	17.4	16.6	15.9	383	207	335	280
Greater Accra	28.8	16.2	14.1	12.8	368	185	315	366
Volta	24.0	20.2	14.5	13.3	450	223	325	269
Eastern	26.7	13.6	12.4	15.7	544	221	403	337
Ashanti	29.3	16.8	20.2	14.3	629	370	485	622
Brong-Ahafo	24.7	19.1	20.8	13.9	485	199	233	366
Northern	25.3	37.6	31.4	15.3	462	226	203	457
Upper East		14.1	19.2	26.9		71	90	104
Upper West		26.3	19.8	20.8		137	179	206
Mother's education								
No education	24.8	24.0	21.3	15.7	1,614	797	1,113	1,339
Primary	27.7	22.2	20.7	16.6	591	374	597	761
Middle/JSS	28.8	16.9	14.5	14.5	1,259	735	1,055	1,055
Secondary+	18.1	10.2	8.2	11.1	182	118	184	185
Wealth quintile								
Lowest	24.7	21.6	23.4	19.7	895	408	786	864
Second	27.1	22.9	17.6	14.2	807	454	635	740
Middle	28.8	21.5	18.6	13.9	715	423	581	656
Fourth	25.0	18.9	15.0	15.2	689	419	534	572
Highest	25.9	14.2	10.9	10.9	553	352	412	507

A consideration to keep in mind when comparing trends in levels of diarrhea over time is that fieldwork may have taken place at different times of the year, which has implications for the consistency of risks for diarrhea over time. If data are collected for one survey during the rainy season when diarrheal disease is most prevalent, and for the following survey they are collected in the dry season when diarrheal disease is less prevalent, the analysis of trends in diarrhea prevalence may be compromised.

As is evident in Table 2.1, fieldwork for the Ghana surveys was conducted at different times of the year for each survey. The rainy season in Ghana runs from April to September, and only the 1988 and 2003 surveys conducted fieldwork during any of these months. Only the last month of fieldwork for the 1988 survey was conducted during the rainy season and thus the season is unlikely to have had a large impact on the prevalence of diarrhea. Three months of fieldwork for the 2003 survey were conducted during the rainy season, and yet the 2003 diarrheal prevalence is the lowest of the four surveys; the seasonality of the data collection efforts has not obscured the continued decline in prevalence of diarrhea.

Acute respiratory infection (ARI) is another leading cause of child mortality. DHS collects data on children's experience of symptoms of ARI (coughing with shortness of breath) in the two weeks prior to the survey. As with diarrhea, prevalence of ARI has declined over time (Table 3.7). There is an unusual dip in prevalence of ARI in 1993 that is out of line with the trends; this could be because in the 1993 survey data were collected only for children under three years of age, whereas for the other surveys, data were collected for children under five years of age. Again, there is no association seen between prevalence of ARI and mortality trends, further supporting the contention that the apparent rise in mortality rates in 2003 is not real but rather an artifact of the 1998 data quality.

Table 3.7 Trends in prevalence of acute respiratory infection

Percentage of children under five years of age with symptoms of acute respiratory infection (ARI) in the two weeks preceding the survey, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children with ARI				Number of children			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	18.1	7.0	11.1	8.9	1,006	568	733	1,114
Rural	20.7	11.3	14.6	10.6	2,640	1,456	2,215	2,225
Region								
Western	22.5	6.5	12.6	12.5	325	185	381	332
Central	24.0	4.3	14.4	10.6	383	207	335	280
Greater Accra	13.3	9.7	10.0	8.1	368	185	315	366
Volta	13.1	14.3	17.5	20.0	450	223	325	269
Eastern	20.4	5.4	13.2	10.4	544	221	403	337
Ashanti	27.2	8.6	13.0	8.0	629	370	485	622
Brong-Ahafo	19.4	9.0	10.9	10.1	485	199	233	366
Northern	17.3	15.9	16.4	7.0	462	226	203	457
Upper East		7.0	15.0	9.2		71	90	104
Upper West		22.6	18.1	7.5		137	179	206
Mother's education								
No education	18.4	12.4	15.3	9.7	1,614	797	1,113	1,339
Primary	21.0	10.4	13.6	10.7	591	374	597	761
Middle/JSS	21.4	8.0	12.9	10.1	1,259	735	1,055	1,055
Secondary+	20.9	6.8	10.0	9.3	182	118	184	185
Wealth quintile								
Lowest	17.5	13.0	27.9	11.4	892	408	786	864
Second	25.3	12.1	24.4	9.9	807	454	635	740
Middle	19.8	9.9	21.0	10.4	718	423	581	656
Fourth	18.1	6.9	15.1	10.3	690	419	534	572
Highest	18.4	8.2	11.6	7.3	553	352	412	507

Tables 3.8 and 3.9 show the trends in treatment seeking for children who have had diarrhea and ARI, respectively, in the two weeks preceding the survey. In both cases, it is important to note that because the number of children sick with diarrhea or ARI is relatively small, interpretation of the figures must be made with caution. Trends in seeking care from a health professional for children with diarrhea are inconsistent, possibly because many parents treat diarrhea at home with oral rehydration therapy rather than taking children for medical care.

Table 3.8 Trends in treatment-seeking for diarrhea

Among children under age five with diarrhea in the two weeks preceding the survey, the percentage taken to a health care provider for treatment, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children with diarrhea taken for treatment				Number of children			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	52.6	35.0	26.4	35.5	272	100	123	152
Rural	39.4	20.6	26.4	21.3	688	310	406	357
Region								
Western	54.1	18.4	30.0	(27.2)	61	38	69	48
Central	49.6	30.6	(26.7)	(23.8)	119	36	56	45
Greater Accra	53.8	30.0	(28.8)	(15.5)	106	30	44	47
Volta	48.1	8.9	(22.6)	(9.8)	108	45	47	36
Eastern	42.8	30.0	(11.7)	(17.0)	145	30	50	53
Ashanti	40.2	29.0	22.6	26.7	184	62	98	89
Brong-Ahafo	38.3	39.5	(16.7)	28.5	120	38	49	51
Northern		12.9	27.1	29.0		85	64	70
Upper East	26.5	*	34.0	32.8	117	10	17	28
Upper West		36.1	60.3	43.0		36	35	43
Mother's education								
No education	36.2	22.0	27.4	26.8	401	191	237	210
Primary	42.7	21.7	21.2	26.3	164	83	124	126
Middle/JSS	50.6	29.0	26.6	22.8	362	124	153	153
Secondary+	48.5	*	*	*	33	12	15	21
Wealth quintile								
Lowest	31.2	17.0	26.5	21.0	221	88	181	170
Second	39.9	20.4	20.7	23.8	218	103	111	105
Middle	43.3	24.4	25.9	24.3	203	90	108	91
Fourth	48.5	30.4	31.3	27.3	171	79	80	87
Highest	60.8	34.0	(32.6)	41.6	143	50	46	55

Note: Figures in parentheses are based on 25-49 unweighted cases; an asterisk indicates that a figure is based on fewer than 25 cases and has been suppressed.

Trends in seeking care from a health professional for children with symptoms of ARI are little clearer than those for diarrhea. In general, treatment seeking for ARI improved between the 1998 and 2003 surveys; however, in many instances the 1988 figures are higher than those for 2003. Regarding regional differentials in treatment seeking for ARI, many of the figures are based on small numbers and therefore must be interpreted with caution. There does, however, appear to be a dip in 1998 in the proportion of children taken to a health care provider for treatment of ARI.

Table 3.9 Trends in treatment-seeking for acute respiratory infection

Among children under age five with acute respiratory infection in the two weeks preceding the survey, the percentage taken to a health care provider for treatment, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children with ARI taken for treatment				Number of children			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	61.0	60.0	36.6	53.0	182	40	81	99
Rural	45.2	34.5	23.6	40.2	546	165	324	236
Region								
Western	56.2	*	(28.6)	(41.4)	73	12	48	41
Central	50.0	*	(25.7)	(22.7)	92	9	48	30
Greater Accra	75.5	*	(33.3)	(57.9)	49	18	32	30
Volta	55.9	(28.1)	(6.7)	(29.0)	59	32	57	54
Eastern	51.4	*	(21.2)	(42.7)	111	12	53	35
Ashanti	44.4	(37.5)	29.5	(57.1)	171	32	63	50
Brong-Ahafo	52.1	*	*	(49.9)	94	18	25	37
Northern		(27.8)	29.8	(39.4)		36	33	32
Upper East	23.7	*	(30.8)	*	80	5	13	19
Upper West		(48.4)	53.2	*		31	32	8
Mother's education								
No education	42.1	35.4	27.7	35.3	297	99	170	130
Primary	55.6	(20.5)	19.5	37.7	124	39	81	81
Middle/JSS	51.1	59.3	24.1	54.5	269	59	136	107
Secondary+	68.4	*	*	*	38	8	18	17
Wealth quintile								
Lowest	31.8	30.7	24.6	31.1	154	166	114	98
Second	41.2	34.9	19.0	40.0	204	192	100	73
Middle	54.2	44.8	23.5	47.2	142	181	85	68
Fourth	64.8	48.6	30.0	50.8	125	144	60	59
Highest	65.7	56.4	(46.8)	(68.9)	102	117	47	37

Note: Figures in parentheses are based on 25-49 unweighted cases; an asterisk indicates that a figure is based on fewer than 25 cases and has been suppressed.

Table 3.10 shows trends in levels of stunting over the four survey periods. Stunting (height-for-age) is a measure of a child's nutritional status that reflects failure to receive adequate nutrition over a long period of time and is also affected by recurrent and chronic illness. It represents the long-term effect of malnutrition in a population and does not vary according to recent dietary intake. Very low height-for-age is the single strongest predictor of childhood mortality in the first five years of life (Branca and Ferrari, 2002).

For residents of both urban and rural households, prevalence of stunting has increased over time. Among the ten regions, five have experienced no change in prevalence of stunting, while four (Central, Eastern, Brong-Ahafo and Northern) have experienced increases, and one has experienced a small decline in the proportion of children stunted (Upper East). The pattern of stunting by mother's educational status is inconsistent, as is the pattern of stunting by wealth.

Table 3.10 Trends in prevalence of stunting

Percentage of children under five years of age who are stunted (below -2 standard deviations from the reference mean), by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children stunted				Number of children			
	1988[a]	1993	1998	2003	1988[a]	1993	1998	2003
Residence								
Urban	25.6	15.7	14.3	20.5	520	521	638	1,050
Rural	31.7	30.1	29.7	34.5	1,321	1,298	1,932	2,132
Region								
Western	30.3	33.1	29.4	28.4	178	169	335	333
Central	40.4	23.0	26.8	31.6	188	191	277	284
Greater Accra	22.1	15.7	11.3	13.9	195	178	278	337
Volta	25.5	19.8	25.1	23.3	243	192	293	259
Eastern	30.2	25.0	23.6	27.4	292	204	360	333
Ashanti	26.7	27.9	27.6	29.1	266	323	420	613
Brong-Ahafo	26.8	24.5	17.8	29.4	268	184	201	356
Northern	40.8	35.9	39.6	48.8	211	184	168	415
Upper East		33.3	34.6	34.1		63	68	95
Upper West		26.0	35.9	31.7		131	171	156
Mother's education								
No education	32.5	30.5	32.1	38.2	752	691	958	1,177
Primary	31.9	26.8	27.5	24.1	310	336	513	661
Middle/JSS	28.2	23.6	20.9	25.8	681	683	928	938
Secondary+	16.3	10.1	13.0	11.1	98	109	171	170
Wealth quintile								
Lowest	66.1	34.2	34.0	41.8	413	365	709	799
Second	67.2	28.4	29.7	31.5	408	415	565	716
Middle	67.9	28.1	27.9	30.2	374	395	519	655
Fourth	72.8	22.3	17.1	24.2	364	390	469	541
Highest	79.1	13.0	10.8	13.2	282	323	388	471

[a] For 1988, the N is children age 3-36 months.

It should be noted that although there were some problems with the collection of anthropometric weight data during the 2003 survey, the stunting measure reflects children's height-for-age, and thus children's weights are not relevant to the calculation of the stunting measure.

Table 3.11 shows the trends in prevalence of maternal malnutrition, as reflected by the body mass index (BMI = kg/m^2). Mother's nutritional status is usually, but not always, directly associated with their children's nutritional status (Rutstein, 1996). This table indicates that maternal nutritional status has remained fairly flat and unchanging over the past three surveys (no maternal anthropometry data were collected in 1988).

Table 3.11 Trends in prevalence of maternal malnutrition

Percentage of mothers of children under five with low body mass index (BMI<18.5), by background characteristics, Ghana 1993-2003

Background characteristic	Percentage of mothers with low BMI				Number of mothers			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	u	9.9	5.4	6.4	u	564	584	2,378
Rural	u	11.9	13.4	12.0	u	1,399	1,673	2,457
Region								
Western	u	13.0	15.8	11.2	u	166	284	498
Central	u	13.1	10.0	6.7	u	205	248	380
Greater Accra	u	5.5	6.0	4.3	u	183	246	848
Volta	u	8.9	9.2	9.7	u	212	253	439
Eastern	u	12.7	12.8	8.9	u	220	315	530
Ashanti	u	11.0	9.5	9.6	u	355	362	917
Brong-Ahafo	u	16.2	13.0	7.2	u	186	186	485
Northern	u	12.5	12.5	12.8	u	233	148	375
Upper East		3.2	12.0	11.3		66	64	126
Upper West		12.3	14.8	23.1		137	151	239
Mother's education								
No education	u	12.8	12.7	12.1	u	775	827	1,297
Primary	u	9.2	11.2	10.3	u	359	459	983
Middle/JSS	u	12.0	10.8	8.2	u	713	828	1,977
Secondary+	u	4.6	5.8	5.1	u	116	142	578
Wealth quintile								
Lowest	u	11.2	15.6	15.5	u	430	859	794
Second	u	13.7	10.7	11.7	u	476	684	805
Middle	u	12.5	9.3	11.3	u	447	632	906
Fourth	u	10.8	7.6	6.8	u	435	555	1,062
Highest	u	6.7	3.8	4.4	u	360	421	1,267

u = Unknown (not available)

Tables 3.12 and 3.13 reflect trends in use of prenatal care and skilled attendance at delivery. Prenatal care and especially skilled attendance at delivery are associated with improved outcomes in child health. The trends in use of prenatal care generally move in a positive direction, although increases over time are not particularly large. Of particular interest is the association between household wealth and use of prenatal care: among the top three quintiles, there is almost universal coverage of prenatal care, while among the bottom two quintiles, continued improvement over time is seen, with even the poorest moving towards universal use of prenatal care from a doctor or a trained nurse or midwife.

Table 3.12 Trends in use of prenatal care

Percentage of live births in the five years preceding the survey for which antenatal care (ANC) was received from a doctor or a trained nurse/midwife, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of births receiving ANC				Number of births			
	1988	1993[a]	1998	2003[b]	1988	1993[a]	1998	2003[b]
Residence								
Urban	93.6	96.7	94.5	97.9	1,110	600	774	946
Rural	78.1	81.5	85.2	88.6	2,979	1,568	2,421	1,699
Region								
Western	89.4	87.3	89.2	94.9	360	204	413	246
Central	78.2	84.9	89.9	94.6	464	224	379	211
Greater Accra	91.2	95.9	92.5	96.3	399	196	329	303
Volta	80.1	85.9	86.1	89.5	591	234	338	220
Eastern	88.1	89.4	89.9	91.7	499	237	430	266
Ashanti	91.5	90.8	95.9	94.2	704	391	514	507
Brong-Ahafo	87.4	90.0	90.3	95.7	530	209	260	297
Northern	53.6	65.8	68.6	82.7	542	254	232	346
Upper East		74.0	67.4	90.9		77	100	83
Upper West		85.9	74.6	85.4		142	199	166
Mother's education								
No education	72.5	75.0	76.7	86.1	1,830	865	1,228	1,025
Primary	84.9	87.5	90.9	92.6	661	402	649	589
Middle/JSS	92.0	94.5	95.7	96.9	1,398	781	1,128	879
Secondary+	97.0	99.2	96.4	100.0	200	120	189	153
Wealth quintile								
Lowest	65.1	75.8	75.0	83.3	1,030	442	871	648
Second	80.9	78.7	86.2	91.3	904	492	688	557
Middle	90.4	83.9	92.2	94.7	791	460	638	534
Fourth	92.4	95.0	94.7	95.3	763	442	571	474
Highest	98.0	97.3	98.1	98.2	596	368	426	433

[a] The 1993 GDHS collected data on births in the three years preceding the survey.
[b] These figures indicate the percentage of women who obtained antenatal care for their most recent live birth in the five years preceding the survey.

Levels of skilled attendance at delivery are not as high in Ghana as levels of usage of prenatal care services. In urban areas, small improvements are seen in skilled attendance at delivery, while small declines are seen in rural areas. In six of ten regions the trend toward skilled attendance is in a positive direction; in three there is little to no change over time (Central, Eastern and Ashanti); and in one (Western) there is a decline in the proportion of births with skilled attendance at delivery. There are small increases in skilled attendance at delivery for all maternal education categories, while the relationship between skilled attendance and wealth status is inconsistent.

Table 3.13 Trends in skilled attendance at delivery

Percentage of births in the five years preceding the survey for which attendance at delivery from a doctor or a trained nurse/midwife was available, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of births				Number of births			
	1988	1993[a]	1998	2003[b]	1988	1993[a]	1998	2003[b]
Residence								
Urban	70.3	81.2	76.3	79.7	1,110	600	774	1,204
Rural	28.9	29.5	34.1	30.9	2,979	1,568	2,421	2,435
Region								
Western	40.0	39.8	44.6	38.6	360	204	413	367
Central	30.8	37.5	40.0	38.4	464	224	379	304
Greater Accra	71.7	80.1	72.6	81.4	399	196	329	390
Volta	32.5	34.2	36.4	45.0	591	234	338	298
Eastern	39.3	55.2	47.3	46.5	499	237	430	362
Ashanti	51.2	55.7	58.0	59.9	704	391	514	685
Brong-Ahafo	46.4	55.5	51.3	58.4	530	209	260	401
Northern	12.7	15.8	11.1	18.3	542	254	232	500
Upper East		22.1	22.1	33.3		77	100	215
Upper West		19.0	16.8	27.8		142	199	118
Mother's education								
No education	25.9	23.8	25.1	29.7	1,830	865	1,228	1,466
Primary	37.3	41.3	39.9	44.4	661	402	649	843
Middle/JSS	54.6	61.2	60.6	64.3	1,398	781	1,128	1,139
Secondary+	79.0	84.2	85.9	89.4	200	120	189	191
Wealth quintile								
Lowest	13.3	25.3	17.9	20.6	1,030	442	871	941
Second	31.0	23.8	31.0	31.9	904	492	688	809
Middle	42.1	31.7	48.1	43.3	791	460	638	721
Fourth	56.8	62.4	65.0	73.1	764	442	571	617
Highest	79.5	85.1	86.2	90.4	596	368	426	551

[a] The 1993 GDHS collected data on births in the three years preceding the survey.

Table 3.14 looks at trends in optimal birth spacing over time. Optimal birth spacing (36 or more months between pregnancies) is associated with improved survival outcomes for children throughout the first five years of life. Table 3.14 indicates that although there is a general positive trend over the past 20 years in proportions of optimally-spaced births, there is little change in this indicator between the 1998 and 2003 surveys.

Table 3.14 Trends in optimal birth spacing

Percentage of non-first births in the five years preceding the survey that had optimal spacing (36+ months), by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of births optimally spaced				Number of non-first births			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	48.3	59.9	65.3	62.6	868	746	537	856
Rural	44.8	48.4	53.8	52.9	2,442	2,211	1,896	1,951
Region								
Western	38.2	49.0	54.9	44.8	272	259	312	280
Central	39.7	46.9	51.0	49.6	383	282	298	239
Greater Accra	46.8	56.5	61.4	63.7	308	230	230	278
Volta	46.1	54.5	64.4	62.6	462	329	254	217
Eastern	43.0	55.4	59.4	49.9	402	305	332	281
Ashanti	43.7	51.0	57.3	55.6	574	518	369	536
Brong-Ahafo	48.4	49.0	53.4	55.9	444	292	203	284
Northern	55.9	46.8	41.1	57.4	465	393	188	420
Upper East		46.8	55.9	55.9		126	84	95
Upper West		58.7	61.9	67.7		223	164	177
Mother's education								
No education	45.5	47.3	54.4	55.7	1,592	1,371	1,034	1,258
Primary	45.5	51.1	55.6	51.7	1,589	532	496	641
Middle/JSS	51.4	55.6	57.9	59.0	107	916	787	802
Secondary+	*	63.8	66.4	59.3	*	138	117	106
Wealth quintile								
Lowest	44.3	50.9	49.4	56.4	865	381	721	778
Second	41.7	55.1	56.1	49.0	749	392	531	665
Middle	48.0	55.1	56.7	55.7	633	379	483	536
Fourth	47.3	53.6	59.9	59.6	611	332	399	443
Highest	49.6	68.3	68.2	62.5	452	265	299	385

Note: An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.

Finally, Table 3.15 examines trends in maternal prenatal receipt of at least one tetanus toxoid injection. Children born to mothers who did not receive tetanus toxoid injections are at risk of dying from neonatal tetanus, which is the most common form of tetanus in developing countries. It is caused by infection of the umbilical stump with spores of Clostridium tetani, either through the use of a nonsterile instrument to cut the cord, or through application of nonsterile materials to the cut cord, such as dung (WHO, 2005). Onset of symptoms begins 3-14 days after birth, usually ending in a neonatal death.

Table 3.15 Trends in receipt of tetanus toxoid injection

Percentage of children whose mothers who received at least one tetanus toxoid (TT) injection prior to delivery, by background characteristics, Ghana 1988-2003

Background characteristic	Percentage of children whose mothers received TT injection				Number of children			
	1988	1993	1998	2003	1988	1993	1998	2003
Residence								
Urban	81.3	91.3	88.9	94.4	1,110	600	774	946
Rural	65.3	72.4	79.9	80.9	2,979	1,568	2,421	1,699
Region								
Western	82.2	80.4	85.6	89.4	360	204	413	246
Central	72.4	79.9	82.1	88.1	464	224	379	211
Greater Accra	77.4	88.8	86.9	90.5	399	196	329	303
Volta	63.1	70.1	77.7	83.1	499	234	338	220
Eastern	71.6	81.4	83.9	83.3	591	237	430	266
Ashanti	71.9	82.1	85.7	88.8	704	391	514	507
Brong-Ahafo	77.7	82.3	85.9	92.0	530	209	260	297
Northern		57.1	65.5	74.1		254	232	346
Upper East	45.9	68.8	62.9	81.3	542	77	100	83
Upper West		83.1	84.8	81.3		142	199	166
Mother's education								
No education	59.8	67.3	73.4	78.5	1830	865	1,228	1,025
Primary	71.6	76.6	82.8	85.3	661	402	649	589
Middle/JSS	79.5	86.9	89.2	92.5	1398	781	1,128	879
Secondary+	84.0	95.0	93.0	96.2	200	120	189	153
Wealth quintile								
Lowest	59.2	66.3	70.0	77.4	613	442	871	648
Second	69.0	68.9	79.2	81.8	842	492	688	557
Middle	76.6	75.2	84.1	86.0	764	460	637	534
Fourth	81.0	85.1	86.2	92.5	743	442	571	474
Highest	85.9	90.8	93.0	95.5	580	368	426	433

Because the variations in the mortality data derive primarily from differences in neonatal mortality rates, a review of trends of receipt of tetanus toxoid is particularly important. Table 3.15 indicates that coverage of at least one[6] tetanus toxoid injection has been on an upward trajectory over time, although there have been small to no increases in receipt of the injections between 1998 and 2003. It therefore does not seem that a sudden drop in tetanus toxoid coverage has been responsible for the apparent recent changes in neonatal mortality.

[6] In order to maintain comparability over time, we look only at proportions of births of children whose mothers received one tetanus toxoid injection, although the recommendation is that all pregnant women should receive two injections. Proportions of women receiving two or more injections over time do not vary between 1993 and 2003, with about 50 percent coverage in each of the three surveys.

In sum, by looking at neonatal, infant, and under-five mortality rates by background characteristics, it was found that Volta, Ashanti, Northern and Upper West regions were characterized by steep dips in mortality levels in 1998 followed by steep increases to pre-1998 levels in the 2003 survey. Northern and Upper West regions in particular are less well-developed and have a less literate population that most of the other regions in Ghana; it is unlikely that they would experience a sudden significant improvement in mortality rates, only to fall back to more typical levels of mortality five years later.

The assessment of trends in the various factors that influence early childhood mortality also does not suggest that there has been a systematic degeneration of gains in these key areas. In fact, some factors associated with improved child survival—such as vaccinations—have continued to improve over time, while other factors that are associated with increases in child mortality—such as diarrhea—have declined over time.

While some factors, like stunting, show a worrisome increase in the 2003 data, overall, factors associated with child survival in Ghana are either improving or remain unchanged over time. Factors associated with child mortality, on the other hand, are mostly either declining or remaining unchanged. There is no clear evidence from this analysis of risk factors for mortality to support the interpretation of the mortality data as trending upward.

4 Conclusions and Recommendations

Taking into consideration the findings of the analysis of Ghana DHS data quality, particularly for the 1998 survey, and the analysis of trends in factors associated with child mortality, the evidence suggests that the apparent uptick in mortality seen in the 2003 Ghana DHS is largely a function of underestimated mortality in the 1998 survey.

While there is no solid evidence to conclude that mortality in Ghana is increasing, the past three Ghana DHS surveys provide substantial evidence that the mortality decline in Ghana has stagnated at very high levels of mortality. The trend data reviewed here suggest that there may be continuing problems in getting adequate nourishment to children. Proportions of sick children receiving medical attention also have not increased over time. While prenatal care coverage seems quite good, there is room for improvement in delivery of tetanus toxoid vaccine to mothers, particularly in rural areas, and skilled attendance at delivery continues to lag. Policies and programs designed to improve these indicators may help to encourage child mortality trends to resume the march downwards towards lower rates.

References

Ahmad, O.B., A.D. Lopez, and M. Inoue. 2000. The decline in child mortality: A reappraisal. *Bulletin of the World Health Organization* 78(10): 1175-1191.

Alderman, H. 1994. Ghana: Adjustment's star pupil? In *Adjusting to policy failure in African economies,* ed. D. Sahn, 23-52. Ithaca, NY: Cornell University Press.

Becker, S. 2005. *Recent changes in childhood mortality in West Africa: Analysis of DHS data from nine West African countries.* DHS Working Papers Number 27. Calverton, Maryland: ORC Macro.

Bossert, T.J., and J.C. Beauvais. 2002. Decentralization of health systems in Ghana, Zambia, Uganda and the Philippines: A comparative analysis of decision space. *Health Policy and Planning* 17(1): 14-31.

Branca, F., and M. Ferrari. 2002. Impact of micronutrient deficiencies in growth: The stunting syndrome. *Annals of Nutrition and Metabolism* 46(suppl 1): 8-17.

Gayi, S. 1995. Adjusting to the social costs of adjustment in Ghana: Problems and prospects. European *Journal of Development Research* 7(2): 77-100.

James, W.H. 1987. The human sex ratio. Part 1: A review of the literature. *Human Biology* 59: 721-752.

Rutstein, S.O. 1996. Factors influencing the nutritional status of mothers and children in sub-Saharan Africa: An analytical report based on the Demographic and Health Surveys. Calverton, Maryland: Macro International Inc.

Sarpong, G. 2004. The murky truth. *The World Press Review,* April 1, 2004.

Stolnitz, G.J. 1965. Recent mortality trends in Latin America, Asia, and Africa: Review and re-interpretation. *Population Studies* 19: 117-138.

Sullivan, J.M., G.T. Bicego, and S.O. Rutstein. 1990. Assessment of the quality of data used for the direct estimation of infant and child mortality in the Demographic and Health Surveys. In *An Assessment of DHS-1 Data Quality*, DHS Methodological Reports No. 1. Columbia, Maryland: Institute for Resource Development/Macro Systems, Inc.

United Nations Children's Fund (UNICEF). 2005. Immunization plus. Available at http://www.unicef.org/immunization/index_bigpicture.html.

World Bank. 2005. *Ghana country brief*. Washington, D.C.: The World Bank.

World Health Organization (WHO). 2005. Immunization, vaccines and biologicals. Available at http://www.who.int/vaccines/en/neotetanus.shtml.